LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.C.A. DEGREE EXAMINATION – **COMPUTER APPLICATIONS**

FOURTH SEMESTER – **APRIL 2023**

UMT 4405 – MATHEMATICS FOR COMPUTER APPLICATIONS

Date: 04-05-2023 Dept. No. Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

PART – A

Answer ALL questions **(10 x 2 = 20)**

1. Express $sin\,\theta$ in terms of ascending powers of θ.
2. Define reciprocal equation with an example.
3. State remainder theorem.
4. Express $cosh^{-1}x$ in terms of logarithmic functions.
5. What do you mean by interpolation?
6. Define a skew hermitian matrix with an example.
7. How do you calculate the eigen values of a matrix?
8. Give two examples for a homogeneous function.
9. Find the partial coefficients of $u = sin(ax + by)$.
10. What is the order of convergence in Newton-Raphson method?

PART – B

Answer any FIVE questions **(5 x 8 = 40)**

11. Expand $\sin^3\theta \cos^5\theta$ in a series of sines of multiples of θ.
12. Separate $tanh\,(1 + i)$ into real and imaginary parts.
13. Find the condition that the roots of the equation $ax^3 + 3bx^2 + 3cx + d = 0$ may be in geometric progression.
14. Find the characteristic equation of the matrix $A = \begin{bmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{bmatrix}$ and hence find its inverse.
15. Prove that $\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$ when $u = log\,\frac{x^2+y^2}{xy}$.
16. Evaluate the partial differential coefficients $\frac{\partial^3 u}{\partial x^3}$, $\frac{\partial^3 u}{\partial y^3}$, $\frac{\partial^3 u}{\partial z^3}$ for the function $u = \sin(ax + by + cz)$.
17. Evaluate $\int_0^{10} \frac{dx}{1+x^2}$ using Simpson's one-third rule.
18. Find an iterative formula to find $\sqrt{N}$ and hence find $\sqrt{12}$ using Newton-Raphson method.

PART – C

Answer any TWO question **(2 x 20 = 40)**

19. Find a real root of the equation $x^3 - 2x - 5 = 0$ by the method of false position correct to three decimal places.

20. Solve the equation $6x^5 - x^4 - 43x^3 + 43x^2 + x - 6 = 0$.

21. Diagonalize the matrix $A = \begin{bmatrix} 2 & -2 & 3 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$.

22. (a) If $z = f(x, y)$ where $x = r\cos\theta$ and y= $r\sin\theta$, then prove that $\left(\frac{\partial z}{\partial x}\right)^2 + \left(\frac{\partial z}{\partial y}\right)^2 = \left(\frac{\partial z}{\partial r}\right)^2 + \frac{1}{r^2}\left(\frac{\partial z}{\partial \theta}\right)^2$.

(b) Expand $cos\ 8\theta$ in terms of $sin\ \theta$. (10 + 10)

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